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Occupational Health in Ontario

Volume 9, Number 1, Winter 1988

Contact Dermatitis in the Textile Industry

The Workers' Registry

Occupational Health Care in Ontario

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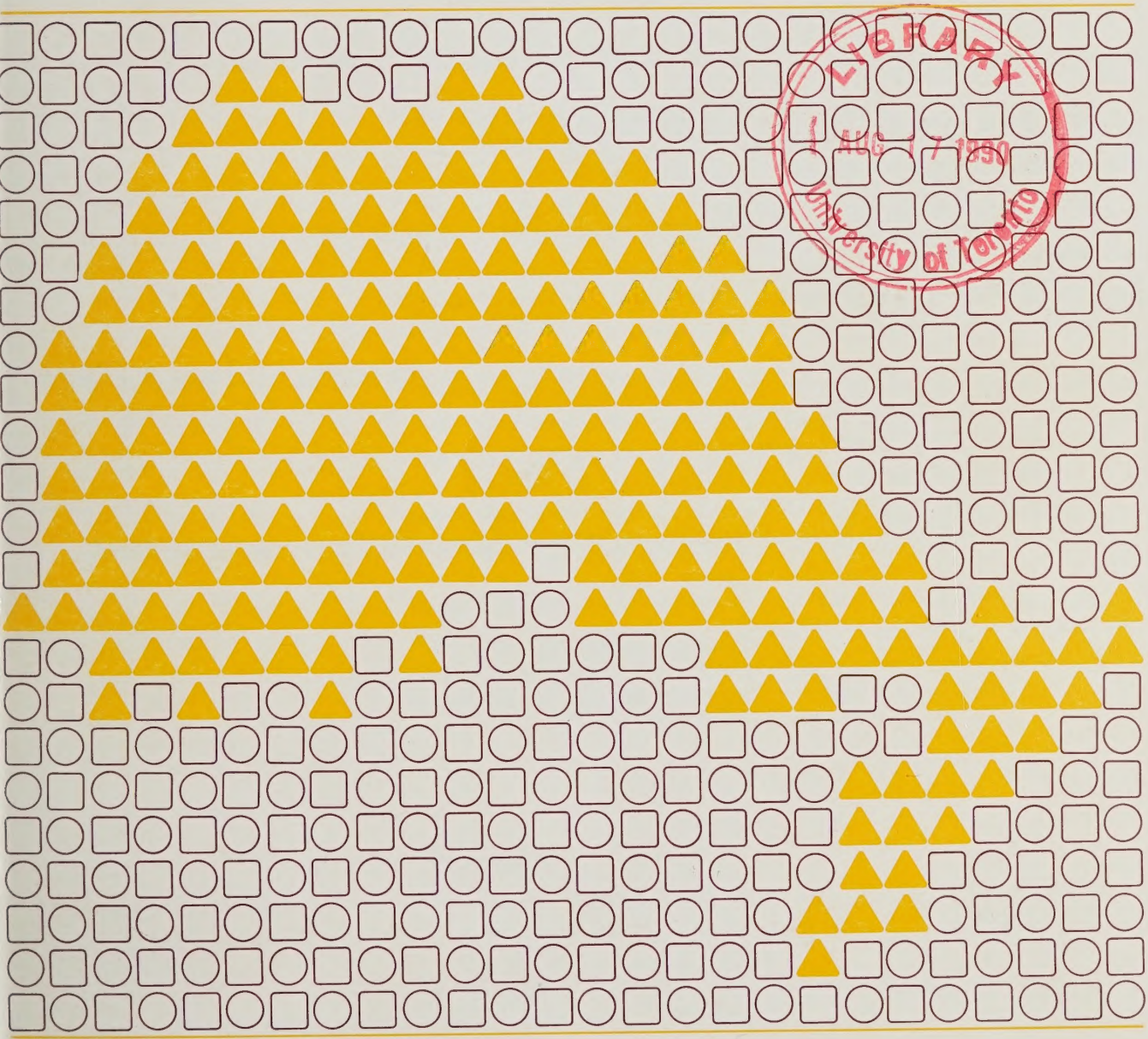

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Occupational Health in Ontario

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Robert Nosal, M.D., FRCPC

Contact Dermatitis in the Textile Industry -- A Plant Investigation

Summary

This paper describes an investigation of contact dermatitis within a textile processing plant and the subsequent identification of the textile type as the causative agent for worker complaints.

Key Words: irritant contact dermatitis, allergic contact dermatitis, sensitizer, patch testing

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Irritant and Allergic Contact Dermatitis

Skin disorders comprise more than 45 per cent of all occupationally-related diseases,[1] and more than 80 per cent of occupational skin diseases are attributable to chemical exposure.[2] The most important category is contact dermatitis, of which there are two main types – irritant and allergic. A skin irritant is any substance that, acting directly, damages the skin at the site of application through a nonimmune mechanism. The subsequent irritant contact dermatitis (ICD) comprises 80 per cent of all cases of occupational contact dermatitis.[3] Skin irritants range from strong to mild; strong irritants being those that are corrosive and that rapidly injure anyone's skin immediately following contact. Examples include acids and alkalies. Mild irritants cause irritation in only a small percentage of exposed persons. However, every individual will develop a reaction following prolonged or repeated contact. Examples include detergents, soaps and organic solvents. Environmental factors that contribute to the development of ICD include low relative humidity, friction, occlusion and sweating.

Allergic contact dermatitis (ACD) is an inflammation that is a consequence of an immunologic reaction to a chemical agent. Allergy is the state of a subject who, sensitive to a substance (allergen), reacts in an abnormal manner (antigen-antibody reaction) towards this substance upon exposure.[4] Any active skin condition, particularly irritant contact dermatitis, may be an important predisposing factor for the development of ACD. ACD is acquired after contact with certain substances. The sensitization can occur after about a week's contact, but may often not develop for years or even decades.

Factors influencing sensitization include:[5]

- sensitization capacity of the chemical
- skin damaging factors
  chemical, physical, skin disease, dryness, hydration
- environment
  temperature, humidity, other chemicals
- exposure
  concentration, occlusion, time, area
- genetic factors

Only very small quantities of the sensitizing substance are required to provoke ACD once a sensitization (allergy) has developed. The allergic reaction causes skin lesions visible from six hours to several days after the contact.

Irritant and allergic contact dermatitis are difficult to distinguish morphologically. Both may be characterized by eythema, papules, vesicles and scaling.

Common sensitizers are listed in Table 1.

Table 1

Metals – Chromium, Nickel, Cobalt
colophony
formaldehyde
Balsam of Peru
Rubber Chemical Additives
– i.e. – mercapto benzothiazole, PPD rubber mixture.
– thiuramsulphides, carbon rubber mixture
Organic dye – paraphenylenediamine
Plastics – epoxy resin
Neomycin
Wood alcohol

When several employees develop skin reactions within a short period, ICD should be suspected in contrast to ACD, where only one or two employees may develop dermatitis, even with exposure to a relatively strong sensitizer.

ACD is of great significance because protective measures are often ineffective and many of those affected must change jobs or learn a new trade.

Patch testing, indicated only in the diagnosis of allergic contact dermatitis, reveals a substantial number of relevant causes. The cutaneous patch test is based on the principle that skin that has already been sensitized to a chemical substance will show an eczematous reaction at a site of application of that substance, reaching maximum development at 48 to 72 hours. The back is the usual site of application for patch tests. Only acceptable concentrations of the test substance in the recommended vehicle should be used. The European Standard Patch Test Series of 20 chemicals recommended by the ICDRG is often the initial series used in the investigation of eczematous dermatitis.[6]

The diagnosis and causal determination of occupational contact dermatitis include a thorough history, which includes a detailed work and exposure history, a physical exam and appropriate tests (i.e. – patch testing)

where indicated. One of the roles of the medical consultant in the Health and Safety Support Services Branch of the Ministry of Labour is to provide a detailed work exposure assessment to assist in the diagnosis of possible work-related disease. This report discusses a visit made to a textile plant at the request of the company's health and safety committee to assist in the investigation of dermatitis in several employees.

Plant Visit

A visit was made to investigate dermatitis in seven 'overlockers' on the finishing floor of a towel manufacturer. Overlockers stitch all around smaller towels. Dermatitis over the previous few months, involving the thumb, index and middle fingers, was only noted with certain lots of yarn and was not associated with any particular fabric or dye. The onset was usually 20 to 30 minutes after starting a particular lot and resolved within a day after another lot was started or on weekends away from work.

Because of concerns that the dermatitis might be due to the chemicals used on the converting floor, the dye and bleach process on the converting floor was detailed.

Process Description

Most of the towel production was bleached at this plant with a first and second stage bleaching.

The first stage bleach consists of the following steps:

- The cloth is fed into a design saturation tank containing 50 per cent caustic, a wetting agent and optical brightener;
- heated at 210°F for 30 to 40 minutes in a 'J-Box' heat chamber;
- one hot rope wash (water) at 170 to 180°F;
- one cold quench (rinse water) for three minutes.

The second stage bleach consists of:

- a bleach saturation consisting of hydrogen peroxide, potassium permanganate, 50 per cent caustic, sodium silicate and a wetting agent;
- J-Box heat chamber (90 minutes at 210°F);
- one hot rope rinse (water) at 150°F;
- one warm rinse (water) at 90 to 110°F.

Only a fraction of the towelling is subsequently dyed in a continuous dye range utilizing azo and oxazine pigments. This towelling then passes through three rinse boxes, which contain decreasing concentrations of acetic acid (pH 5.5 to 6 in the last wash box). Fresh water is pumped into the third wash box.

After bleaching, the cloth is taken to the finishing range, where it is passed through a tank containing softener and acetic acid and then dried at 300°F for 10 to 15 minutes. After drying, the towelling is taken to the finishing floor, where the towels are cut, hemmed and folded.

It was noted that, although overlockers and other sewers work on towelling from the same lot 95 per cent of the time, the lots that caused symptoms in overlockers did not usually cause dermatitis in the other sewers. Also, the employees who worked on the converting floor (bleaching and finishing range) did not complain of dermatitis.

It was noted in addition that if the towelling is not rinsed properly during second stage bleaching, excess alkali and sodium silicate remain on the fabric, usually causing it to yellow. The pH of the towelling is normally 7.3 to 7.5 after the rinsing process.

On the day of the visit, the six overlockers were observed cutting and hemming face towels. All four sides of the towels were hemmed and the towels were continually rotated by the employees for sewing. The cloth was usually held by the index and middle fingers of the right hand and by the thumb and index finger of the left hand. The employees were not experiencing problems with the lot of towels being sewn on the day of the visit. However, a resolving dermatitis was noted in one of the overlockers, indicated by slight erythema and minimal scaling, especially on the lateral aspect of the left index finger.

Recent Production Changes

Open-end yarn (OES) was now being used instead of ring-spun yarn. The OES is 'harsher' to touch and had been in use over the past few months. In addition, the overlockers' sewing machines were now running at a faster speed.

Initial Conclusion

At the time of the visit, it was felt that the dermatitis was likely attributable to mechanical irritation of the skin related to towel fibres, machine speed, etc. Although a chemical etiology related to residual acetic acid or another irritant was possible, it was probably only a contributing factor. A previous visit to this company had also concerned dermatitis, which had developed on the forearms in four employees in the sewing department. The etiology of that dermatitis was felt to be mechanical irritation of the forearm during sewing, and methods to

decrease mechanical irritation were advised, with subsequent resolution of the dermatitis.

Laboratory Investigation

On the day of the visit, overlockers indicated that they experienced dermatitis when sewing rolls of pink and dark brown towels but had no problem with the light orange towels. Towel samples were therefore sent to the Ministry of Labour Occupational Health Laboratory for analysis of differences in fibre morphology between the towel lots and pH determination.

An alcohol extract of samples of the three towels revealed small amounts of fatty acid ester; a water-extract of each produced solutions with a pH of 5.5. However, the fibre analysis confirmed that in the towel lot that was not known to cause dermatitis, fibre bundles were woven differently than in the lots known to cause dermatitis. (See Fig 1.) The light orange bundles were composed of threads that were intertwined and running concurrently in one direction. The pink and brown towels, had, in addition, groups of strands running perpendicular to their parallel threads, thereby lending these towels a rougher finish.

Comment

The probable cause of the occupational dermatitis at this plant was determined from the employees' history of the dermatitis, a brief physical exam and a detailed exposure assessment. The brief physical exam was possible only because of the easily discernible nature of the presenting complaint (dermatitis involving the fingers and hands). A more detailed physical examination, along with appropriate clinical tests where indicated, can only be carried out by the employee's examining physician. Such an exam is usually indicated, and, in fact, was recommended for the symptomatic employees, to obtain a definitive diagnosis for each case.

However, a history of the dermatitis and detailed work and exposure history can often focus on one or more probable etiologies and can certainly eliminate many other possible causes. Such was the case in this investigation.

For example, it is known that textile industry workers may develop purpuric dermatitis and extensive hyperchromatism.[7] Although textile fibres themselves are not usually allergenic, contact sensitization observed in the industry is due to treating-agents such as dyes (i.e. azo-dyes), mordants (potassium dichromate), crease-resistant finishes (urea-formaldehyde resins), spot-removing products (hydrazine) and anti-microbials

Figure 1 SEM Micrographs at 1,000-Fold Magnification Showing the Weaving Characteristics of the Three Textiles in Question.

(a) Orange Fibres

(b) Pink Fibres

(c) Brown Fibres

(cresol, pentachlorophenol, phenylmercuric nitrate).[4] In fact, patch test series are available for dermatitis acquired in the textile industry.[7]

At this plant, the work and exposure history eliminated most of the above sensitizers as possible causes. The clinical history was also more compatible with irritant contact dermatitis. Irritants in the bleaching and finishing process included acetic acid, caustic, sodium silicate, hydrogen peroxide and potassium permanganate.

In addition, the wetting agents (one of which was an aqueous solution of the pentasodium salt of diethylene-triamine-penta-acetic acid) and the softener (a blend of quaternary amines and esters) are known as slight to moderate skin irritants.

Proper rinsing during second stage bleaching would have removed excess alkali and sodium silicate, along with the other irritants. The final finishing range consisted of a tank containing acetic acid, which probably accounts for the pH of 5.5 in the towels that were analysed.

Thus, even before observing the work practices of the overlockers and enquiring about changes in products and processes, one could determine that a mild irritant(s) could be a contributing factor to the dermatitis, but that sensitization was not probable. Of note was the fact that the other employees involved with sewing were not complaining of dermatitis.

The recent use of coarser fibres, the overlockers' work practices as discussed above and the increased speed of the sewing machines in the previous months all pointed to mechanical irritation as a major contributory factor to the onset of dermatitis.

The laboratory analysis of fibre morphology was able to confirm this initial hypothesis.

The etiology of contact dermatitis may be due to one agent or it may be multifactorial. The probable causes(s) can usually be determined from a clinical history of the dermatitis, work and exposure assessment, observation of work procedures and knowledge of the causative agents of irritant and allergic contact dermatitis.
A definitive diagnosis for a particular worker can only be made by the employee's examining physician, who may need to utilize patch testing to determine the etiologic agent(s).

Résumé

Dans cet article, on décrit l'enquête sur l'eczéma de contact menée dans une usine de textiles et l'identification subséquente du type de textiles qui est la cause des maux dont se plaignent les travailleurs.

Acknowledgement

The author wishes to acknowledge Dino Mozzon for his invaluable assistance in reviewing the plant process, described on page 4.

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The Workers' Registry

Summary

The Workers' Registry is a monitoring system for pneumoconiosis that provides 10 years of follow-up after hazardous dust exposure ceases, avoids unnecessary chest X-ray screening until 2,000 hours of exposure have accumulated and allows flexible reporting to the physician of the worker's own choosing.

Key Words: Pneumoconiosis, asbestosis, silicosis; surveillance, computer registry

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The Workers' Registry is the Ministry of Labour Chest Clinic's computer data base for Ontario workers at risk of developing pneumoconiosis. The pneumoconioses give no early symptoms and are, therefore, not likely to be detected by either patient or physician at an innocuous stage unless a specific effort is made toward case-finding in appropriate populations. The word *pneumonokoniosis* was coined in 1866 by Zenker from Greek.[1] The original term was modernized to 'pneumoconiosis' by Proust in 1874.[2] It pertains to the lung's *(pneumon)* reaction to dust *(konios).*

The commonest types of pneumoconiosis experienced in Ontario industries and mines are silicosis and asbestosis, due to the inhalation of silica and asbestos dusts respectively. The dust has to be ground sufficiently fine to be 'respirable', i.e., it has to be of the order of about one to 10 micrometres to be able to reach the alveolar region of the lung – the deepest part with the finest airways – in which respiratory gas exchange takes place.[3] At that level, the finely powdered dust particles may overwhelm the body's defence mechanisms and cause scarring of the lung tissue in a variety of characteristic patterns that are not only detectable on pathology slides under the microscope but, much more conveniently, on a chest X-ray.

Scars tend to contract and may thereby cause either stiffening of the lung or interference with airflow, depending on their location. Fortunately, the lung has an amazing amount of reserve capacity and can cope easily with a substantial amount of scarring. But, ultimately, it may begin to fail, and this can be shown on a simple screening pulmonary function test known as forced expiratory spirometry. To yield reliable results, the test has to be directed with good technical skill on the part of the technician. Similarly, the chest X-ray has to be of the right quality since both over- and underexposure of the films can easily lead to false interpretations.

Early Pneumoconiosis Surveillance in Ontario

Silicosis from Ontario mine dust exposure was first reported in 1924.[4] The early research surveys were soon followed by regular service-oriented surveillance programs under the direction of the Workmen's Compensation Board of Ontario.[5] Although initially limited to hardrock mines, the surveys were extended to surface industries in 1952 with the introduction of the Regulations under the Silicosis Act.[6] The surveillance consisted of chest X-rays and the collection of exposure records until the late 1960s, when spirometry was added for the following of asbestos workers.This became mandatory under the Asbestos Regulation of 1982.[7]

Under the *Occupational Health and Safety Act* and its Regulation respecting Silica of 1983,[8] the standard surveillance requirement is a chest X-ray (single postero-anterior view), forced expiratory spirometry and a short questionnaire on respiratory symptoms and past illnesses.

Chest X-rays are essential in detecting and following the course of pneumoconiosis, but are not usually appropriate for detecting or following occupational asthma – another common problem in some industries. For this reason, the Chest Clinic of the Ministry of Labour's Health and Safety Support Services Branch concentrates its effort on those conditions that it can monitor best with the X-ray-spirometry-questionnaire combination. Workers with occupational asthmas and other respiratory problems need to be followed more frequently with respiratory questionnaires and peak flow monitoring, supplemented by spirometry before and after shifts in suspected cases of asthma.

Regulated Surveillance

The initial silica and asbestos designated substance regulations are appropriate for fixed-site industries. They require a pre-employment examination and follow-ups at least every second year.

Insulators, construction workers and maintenance workers are exposed intermittently and often infrequently. They require a different approach to obtain the baseline X-ray and follow-up to avoid excessive testing.

At the other end of the exposure spectrum – after a worker has ceased exposure – the accumulation of dust in the lungs may, in some, produce scarring that progresses for several years after the last dust inhalation. Examples of such persons would be retirees, as well as those who move away from high-risk jobs or environments. If a follow-up is continued for 10 years after exposure ceases and the chest X-ray remains free of pneumoconiosis, it is thought that none will develop later. This is based on

Ontario experience from 1927 to 1987 with silica and asbestos workers who have entered claims with the Workers' Compensation Board of Ontario.

With the introduction in 1986 of the Regulation respecting Asbestos on Construction Projects and in Buildings and Repair Operations,[9] a modified monitoring program was required. There is no evidence that persons with less than one year of exposure to asbestos dust will develop pulmonary parenchymal asbestosis. Hence, it is recommended that the initial or baseline examination of asbestos workers who fall under this regulation should be made after the accumulation of 2,000 hours of potential exposure. This represents about one working year or 250 eight-hour working days. In 1987 the Chest Clinic completed a new computer program that identifies all workers who, on the basis of their submitted work records, attain a cumulative 2,000 hours of exposure to asbestos dust. At the completion of each project or at least once a year, employers of workers in asbestos exposure covered by the 1986 regulation are required to send a Work Record report of hours worked and the nature of exposures to the chief physician of the ministry. This information is entered cumulatively into the worker's data base.

Upon reaching the 2,000 hours, an invitation to attend an examination is sent to the worker with a list of ministry mobile or fixed-site chest clinics where he may obtain the required X-ray and lung function test. The medical report is then sent to his physician in the usual manner with a note of explanation drawing attention to the possible asbestos-related diseases that may affect the patient. A note is also sent to the worker, indicating that a physician's report has been sent and advising him of symptoms that may be caused by asbestos-related disease. If these symptoms are present, or should the worker develop them, he is advised to alert his physician to the possible association with prior asbestos exposure.

Normally, the tests are repeated every second year, but the frequency may be increased subject to the orders of the examining physician. Asbestos workers who have exceeded 10 years in exposure are scheduled for re-examination every year thereafter.

Follow-up of Workers Who Are No Longer in Exposure

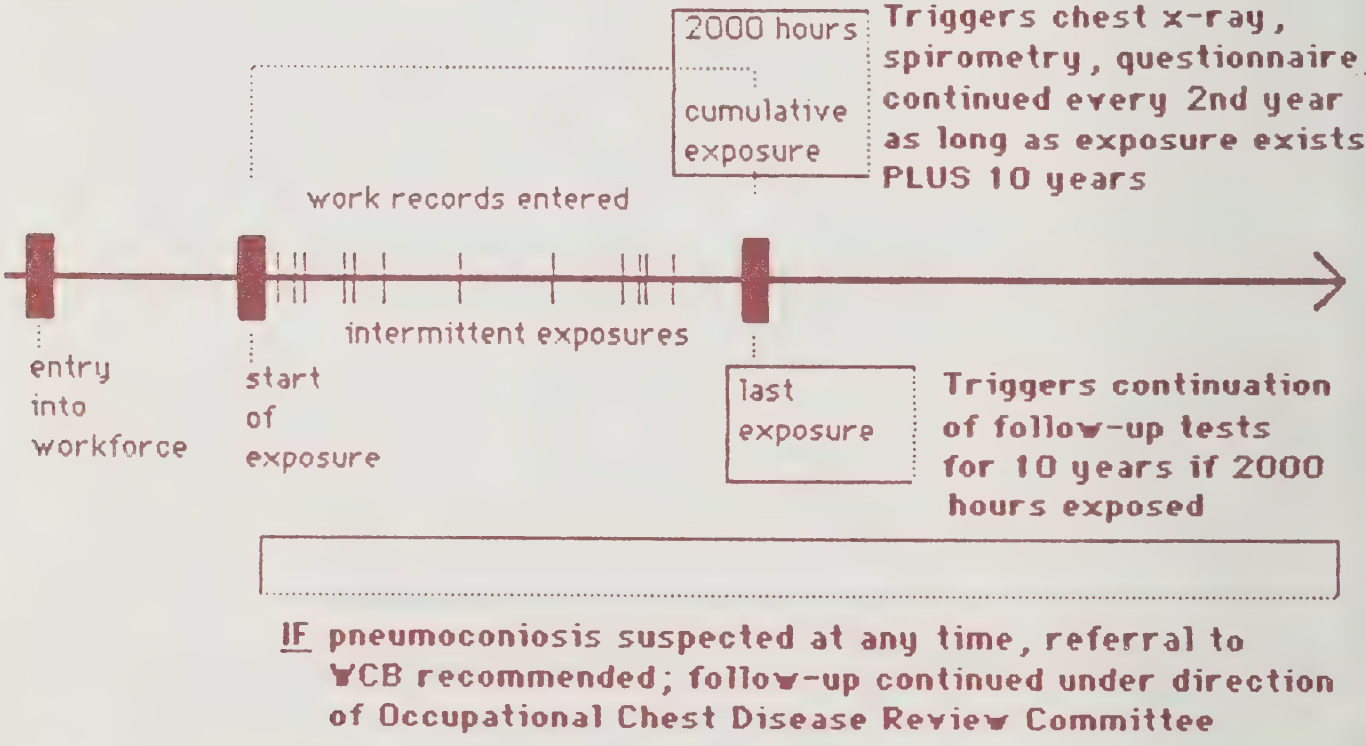
Exposure to a noxious inhaled substance may cease; yet the already inhaled dust can continue to cause the appearance of pneumoconiosis a few years later. The Workers' Registry system permits the Chest Clinic to follow a worker who ceases asbestos or silica dust exposure and recall him every second year, for up to

a total of 10 years, for chest X-ray, spirometry and questionnaire. If an abnormality does occur within this time, the clinic's staff, in a report to the worker's physician, recommends that a claim be entered with the WCB. If this is done, subsequent follow-ups will be directed by the Occupational Chest Disease Review Committee (OCDRC). Usually, such follow-up is continued indefinitely.

If, however, no abnormality is found within 10 years, a letter is sent to both physician and worker recommending that subsequent monitoring be done under the guidance of the worker's physician.

The flow of worker monitoring is illustrated in Figure 1.

Figure 1


2000 hours
cumulative exposure
Triggers chest x-ray, spirometry, questionnaire continued every 2nd year as long as exposure exists PLUS 10 years
work records entered
intermittent exposures
entry into workforce
start of exposure
last exposure
Triggers continuation of follow-up tests for 10 years if 2000 hours exposed
IF pneumoconiosis suspected at any time, referral to WCB recommended; follow-up continued under direction of Occupational Chest Disease Review Committee

Present Status of the Workers' Register in the Chest Clinic

The registry contains the names of all dust-exposed workers under surveillance since 1978 and it now has a total count of 117,703 workers. Workers who are currently exposed number 79,234. There are 35,489 individuals who are ex-exposed and still being followed, and 2,980 individuals are registered under the Regulation respecting Asbestos on Construction Projects and in Buildings and Repair Operations. Of the latter, 29 had exceeded 2,000 hours of exposure and had been tested and nine others had been notified to come for testing. Other details of the content of the registry are listed in Tables 1 and 2.

Table 1

	Exposure	Workers Now in Exposure	Workers Previously in Exposure
Fixed-site exposures	Asbestos	7,114	5,427
	Asbestos and silica	7,569	4,625
	Silica in foundries	10,998	10,789
	Silica in mines	21,199	189
	Other silica	17,168	8,008
	Other dusts, fumes	15,186	6,451
Transient exposures	Asbestos	2,980	
Total		82,214	35,489

Table 2

Workers in Asbestos Exposure on Construction Projects, in Buildings and Repair Operations	Exceeding 2,000 hrs	Examined in 1987	Pending Notification
	2,980	29	9

Usefulness of the Workers' Registry

The adoption of flexible programming to cover both transient and fixed-site workers offers several benefits. It permits the Chest Clinic to respond to the wishes of those workers who prefer to deal only with their personal examining physicians.

The opportunity to avoid taking a baseline reading on transient workers until 2,000 hours of exposure have accumulated prevents unnecessary X-ray exposure. There is no evidence that asbestos dust exposures of shorter duration are capable of causing asbestosis under present-day control measures for exposure.

The opportunity to partake in the ministry's continued surveillance program for 10 years after the last exposure provides important coverage to a group of workers who previously had no such organized facility. The service is offered through both mobile and fixed-site clinics and meets the convenience of the previously exposed employee.

Future Trends

By mid-1987 the number of workers who had exceeded 2,000 hours in intermittent asbestos exposure was only 38 out of 2,980. However, a large number of persons were very near the mark, and initial examinations were

expected to reach the hundreds in the near future. With the decreasing use of asbestos and other fibrogenic respiratory hazards in the workplace, it is clear that the numbers of ex-exposed workers will continue to rise sharply and that the number of workers still in exposure will gradually diminish.

Résumé

Le registre des travailleurs est un système de documentation sur la pneumoconiose qui permet d'assurer le suivi jusqu'à dix ans après la fin de l'exposition aux poussières dangereuses, d'éviter les radiographies pulmonaires inutiles en limitant la fréquence des examens radiographiques à toutes les 2 000 heures d'exposition et de faciliter la préparation des rapports destinés au médecin que le travailleur a choisi.

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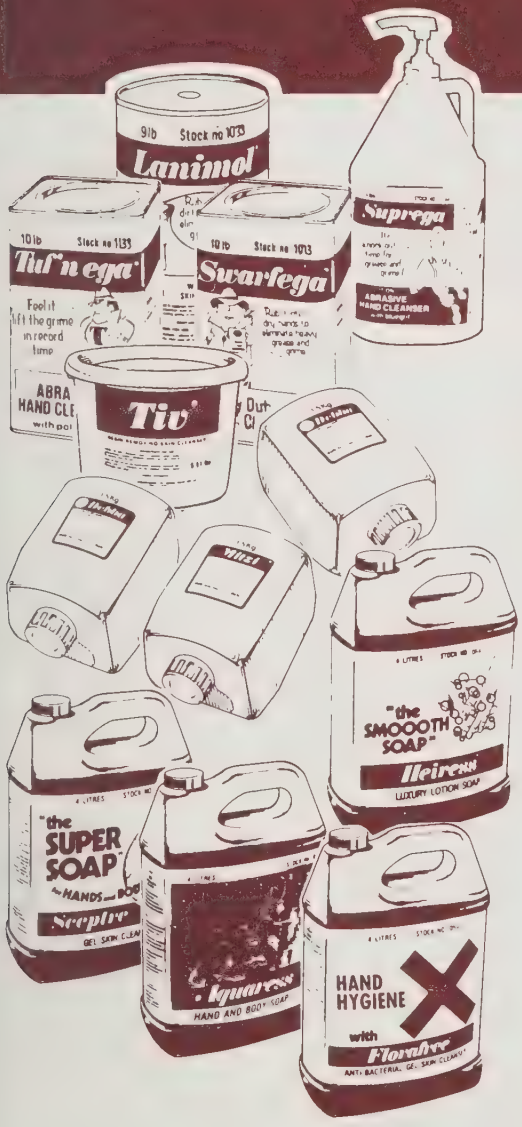

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Occupational Health Care in Ontario

Summary

This article describes the evolution of occupational health care in Ontario, the services delivered and the legislative changes.

Keywords: occupational health, legislation, government

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Ontario was developed by people who cleared, planted and harvested the land. While the north remained largely underpopulated, except for foresters and miners, southern Ontario slowly moved from an agrarian population to a mixed urban, industrial and rural farming society. As manufacturing increased, so did the need for legislation to protect the health and safety of workers.

An Act for the Protection of Persons Employed in Factories was passed into legislation in 1884. This was the first of such legislation in Canada. The early members of Ontario's legislature could not envision the number and complexity of hazards to today's work force. There were few chemicals and no nuclear energy, and most of the machinery was steam-powered. The Act addressed child labour and was intended to protect children, young girls and women from exploitation. It also recognized good sanitation and public cleanliness as means for preventing disease.

> *The Ontario Factories Act,* 1884 c.39, s.12(1): In every factory where, contrary to the provisions of this Act, there is an omission, act, neglect or default in relation to any overcrowding, ventilation, drain, privy, earth-closet, water-closet, ash-pit, water supply, nuisance or other matter whereby the health of persons employed in the factory may be affected, the employer shall within a reasonable time take such action thereon as the Inspector, acting under the regulation, may, in respect to such subjects, notify the employer to be proper and necessary – – –
>
> c.39, s.11(3): Every factory shall be ventilated in such a manner as to render harmless, so far as is reasonably practicable, all gases, vapours, dust or other impurities generated in the course of the manufacturing process or handicraft carried on therein that may be injurious to health.

The Act regulated activities and defined factories. It prescribed penalties if permanent injury to workers' health occurred and it limited the number of hours of work for

children. Upon summary conviction, an employer could be jailed for six months or fined not more than $100.00. The legislation prescribed the maximum hours of work per day (12½) and of work per week (72 hours); however, the inspector could make an exception in unusual circumstances, at harvest time, for instance, when the lack of refrigeration required immediate processing of foods.

The Act also addressed over-crowding, ventilation, lavatory facilities and the removal of effluvia. It gave vast discretion to the inspector, prescribing that he could enter a factory by day or night, or any premises he reasonably believed to be a factory, and demand to see any register or document that the Act required to be kept. The inspector could take a policeman along to examine both the premises and the persons found therein.

In 1885, health revisions were incorporated, including the provision of water closets. The revisions of 1904 required the confinement of long hair, and normal working hours were not to pass 6:00 p.m. The Act prescribed the number of water closets per groups of people, the provision of suitable drinking water, the heating of rooms to not less than 60°F and the provision of spittoons.

In 1914, the *Workmen's Compensation Act* was passed; it provided for primary occupational health education and accident prevention as well as disease control measures.

As industrialization increased, primarily due to World War I munitions activities, so did the power of the inspectorate to guard the health and safety of workers. The *Factory Shop and Building Act,* which was enacted during World War I, had provisions for the health of the workers. In 1918 proper lighting was regulated so as not to injure the safety, health or comfort of the employees.

The Ontario Board of Health legislation was enacted in 1901 to deal with the sanitation and medical care of workmen employed in camps in the territorial districts within municipal organizations.

In 1920 the Division of Industrial Hygiene within the Board of Health, Department of Labour, was established, and it assumed responsibilities for the enforcement of the legislation dealing with the medical care of workmen in camps. The division was formed as a result of the report of the Federal Committee of Industrial Fatigue in 1919. It was equivalent in nature to units established in 1913 by the Department of Health in Ohio and, subsequently, by the Department of Labour in New York.

Dr. Cunningham, the division's first director, and Dr. Riddell, who joined him in 1922, as pioneers in the field of occupational health, became founding members of the Ramazzini Society, an organization with a limited

membership of distinguished occupational health physicians, which still meets in the United States today. Bernardino Ramazzini, whom the Society is named after, lived from 1633 to 1714 and is often called the father of occupational medicine. In his practice he inquired of the occupations of his patients and studied the conditions of their work. In 1700 he published a book on the diseases of workers entitled *De Morbis Artificum.*

In 1926 the occurrence of fatalities among workers required to work with compressed air led to the introduction of specific regulations. These, with certain modifications, are basically in effect today and are enforced by the Ministry of Labour. The regulation included the requirement of compulsory medical supervision of workmen handling dangerous material, and the value of this provision was soon recognized. Provisions were made under the *Factory, Shop and Office Buildings Act* to require, at specific intervals, examination of workmen in industrial processes considered detrimental to health. The Division of Industrial Hygiene developed standards that the inspectorate, employed by the Department of Labour, could apply. In 1932, amendments to the Act prohibited the employment of children and required the labelling of benzol, periodic medical examination of employees and the reporting by the employer of any cases of industrial disease directly to the director of Industrial Hygiene. Special precautions were necessary in the manufacture and distribution of benzol and lead.

In 1926 Dr. Cunningham published the results of a silicosis survey conducted in October 1925 at the Porcupine Mining Camp. Of a total of 236 miners examined, only 98 were not considered to have tuberculosis or silicosis or a combination of both. This led to compensation payments to miners with silicosis and to improvement in the working environment in the mines. In 1929 the Workmen's Compensation Board (WCB) established special clinics for the regular examination of underground miners in Northern Ontario and set up the Silicosis Referee Board, on which the division was represented. Subsequently, similar surveys were conducted in other industries using silica-containing materials, and in 1950 the *Silicosis Act* was passed. This Act required workmen to have a health certificate for employment in certain industries involving silica exposure. Such health certificates were issued following examinations conducted by the Ministry of Health at specific intervals (1½ years). The WCB Miners' Chest Clinics in Northern Ontario were transferred to the

Ministry of Health in 1974 and to the Ministry of Labour in 1982. There are five at present.

The cost of the clinics' operation is covered by the WCB from its levies on industry, and the WCB, in turn, reimburses the ministry to which the clinics are attached – currently, the Ministry of Labour. The funding for these clinics through employer WCB assessments is specifically provided for in the recently revised *Workers' Compensation Act.*

The chest clinics in southern Ontario were established by the Ministry of Health in 1948 to monitor the health of workers employed in a variety of surface industries where workers could be expected to be vulnerable to diseases caused by dust inhalation. In 1976 the southern chest clinics were transferred to the Ministry of Labour, and they now constitute one fixed-site unit and four mobile tractor-trailer units.

The Division of Industrial Hygiene's interest in lead poisoning was evidenced by its publication of a book on the subject in 1923. This book included a survey of medical literature, a description of the lead trades, a review of legislation in many countries and a compilation written by W.E. Green, the division's chemist, on laboratory and clinical tests for lead. The determination of lead in urine must have been an unpleasant chore in those days since the methods described involved evaporation of several litres of urine, with constant watching to avoid boiling over, and precipitation of the lead with hydrogen sulphide.

In April 1927 the Provincial Board of Health 'After a valued career of 26 years', was abolished and its functions absorbed by the Department of Health. Thus, after seven years, the Division of Industrial Hygiene left the Department of Labour, not to return for 50 years.

An Occupational Health Library was established in the 1930s and formed the nucleus of a very extensive reference centre, now located at 400 University Avenue within the Ministry of Labour Library. By 1960 the library held over 100,000 references, which, at the time, was one of the most comprehensive that was available in North America.

During World War I, occupational health services flourished in Ontario industries, but, following closely the fortunes of the province, they diminished somewhat in the 1920s and virtually disappeared during the depression years.

During World War II, because of the recognized authority of the division in dealing with industrial health, the Allied War Supply Corporation secured the

services of a physician from the Ontario staff to direct its health and medical programs. This corporation controlled over 40 munitions plants across Canada. At peak operations they employed more than 4,000 workers, most of them having contact with toxic materials. Besides organizing control methods for occupational disease, it was necessary to plan for the medical care of some 10,000 persons who lived on plant premises. The majority of these plants were located in Ontario. Many of them hired permanent staffs of physicians and nurses and set up comprehensive in-house occupational health programs.

Within the division, a variety of initiatives developed over the years, leading to a new and different service. Very early on, a public health engineering group was formed, and it operated until the early 1950s, when it was removed from the Department of Health to the Ontario Water Resources Commission.

The Division of Industrial Hygiene also carried out such diverse activities as public health inspection in unorganized territories, the enforcement of regulations for stuffed articles and the licensing of pest control operators and the use of pesticides. These activities were carried out until the 1970s, and are now conducted by different ministries of the government.

The earliest report of an occupational health nurse employed by Ontario industry concerned Olive Bradley, who, in 1908, began employment at the Plymouth Cordage Plant, located in what is now Welland, Ontario. This was a Canadian subsidiary of an American firm that had an established occupational health nursing service. Her job description shows that she not only undertook much occupational health counselling of employees, but she counselled their families as well. She also looked after the first aid and rehabilitation requirements of company employees. The first known occupational health physician who worked in a plant was Dr. H.D. Cowper. He was employed on a part-time basis in 1930 to make regular visits to the Plymouth Cordage Plant.

In 1943 occupational health nursing consultants were employed by the division to assist industry in setting up occupational health services and to try to improve services that were already available. Special forms were devised for the recording of morbidity experience, and these, conforming to international standards, provided comparable data for companies. An industrial health service for a group of small industries was introduced in the Kitchener, Ontario area in 1956. The group concept experiment was unique in Canada in that it was govern-

ment financed and government staff participated in its operation. After two years all but one of the industrial establishments involved continued their health centres independently. In 1943 the publication 'News Note for Nurses' was started. This was the predecessor of the journal *Occupational Health in Ontario.*

The division had a long history of dealing with radiation problems. It was therefore selected by the government in 1933 to build and operate a plant to produce radon seeds for cancer clinics in Ontario. Artificial radioactive compounds have now supplanted radon seeds, and the radon plant was closed in 1959. Since the beginning of the atomic age, activities in the field of radiation protection have increased, and in July 1961 a modern radiation protection laboratory was opened. It was moved in 1980 to the present site at 81 Resources Road, Toronto.

The early history of the Occupational Health Laboratory is somewhat obscure. It is known that a chemist named George H. Bostock was hired around 1920, but he left shortly afterwards to become a factory inspector. He was replaced by Mr. W.E. Green, who resigned in 1924. Mr. A.G. Rothwell then became the chief chemist, and he remained in that position until his death in 1951. The laboratory had a series of homes and chiefs, and, in 1980, moved to an up-to-date facility at 101 Resources Road, Toronto. It is now one of the leading occupational health laboratories in North America.

Over the years, the Division of Industrial Hygiene, later named the Occupational Health Protection Branch, continued to investigate new areas of occupational health concerns and provide companies and the government inspectorate with assistance in investigating occupational disease or illness. The branch was also involved in the development of legislation for Ontario workers. The legislation included the *Silicosis Act* of 1950, the *Pesticides Act* of 1956 and the *Air Pollution Control Act* of 1958. The mortality studies of sinus and lung cancer of refinery workers at nickel smelting plants resulted in the 1961 *Radiation Protection Act* to prevent radiation overexposure.

In 1971 a mobile audiometric clinic was acquired to investigate hearing loss in small plants, and it continued to operate for six years. In 1973 and 1974 the branch, under the Ministry of Health, played an active role in standards setting and the investigation of health issues for both the Workmen's Compensation Board and the Inspectorate of the Ministry of Labour.

In 1976 a Royal Commission for the Health and Safety of Workers in Mines recommended that the Ministry of Labour include the Occupational Health Protection Branch of the Ministry of Health and the Mining Section of the Ministry of Mines and Natural Resources. The cabinet supported the recommendation and combined these groups with the industrial and construction health and safety inspectorate to form the Occupational Health and Safety Division of the Ministry of Labour on December 17th, 1977. The *Occupational Health and Safety Act,* 1978, with its industrial mining and construction safety regulations and designated substances regulations followed. As of October 15th, 1987, there were 22 regulations under the Act.

Education

In the early years of this century, and until World War II, there was little or no preparation or education in occupational health or industrial hygiene in the province. People were self-taught or went to the United States for further education. During, and since, World War II, groups such as the College of Physicians and Surgeons, the Ontario Occupational Health Nurses Association, the Registered Nurses Association of Ontario and the universities established short-term training programs in occupational health. Following World War II occupational health electives became possible in public health diploma courses.

The University of Toronto initiated a Diploma in Industrial Hygiene for physicians in 1942. This became a multidisciplinary course in 1979. That same year, the University of Toronto added a Master of Health Science course, where the student may elect to major in occupational health. In 1980 McMaster University began a multidisciplinary diploma program in Occupational Health and Safety. This program has two attendance options, i.e., three months continuous attendance or one day a week attendance over 10 months, with a week of continuous attendance.

In 1978 the Ministry of Colleges and Universities approved, for inclusion in the community college system, a 450-hour post-basic occupational health nursing certificate program. This year the certificate program is available in Ottawa, Toronto, London, Hamilton, Windsor and Brockville. Lakehead University also offers a continuing education course. The University of Waterloo offers an occupational health nursing course that is completed by correspondence and two three-week periods of in-house lectures. The credits from this course are accepted for basic Bachelor of Science degrees at the University of Western Ontario.

The Ontario Occupational Health Nurses Association, with funding from the Ontario Lottery Corporation, has developed, in collaboration with the Canadian Nurses Association Testing Service, a comprehensive certification examination. The Canadian Council for Occupational Health Nurses Incorporated was established in 1983 with the first certification granted.

The Canadian Board of Occupational Medicine has, by examination, been certifying physicians since 1981, and the College of Physicians and Surgeons of Canada is now offering a Fellowship in Occupational Medicine. The first examination will be held in 1988.

Industrial hygienists may become certified under the American Board of Industrial Hygiene. Equivalent certification will soon be available under a Canadian board.

Short continuing education courses related to audiometric testing and pulmonary function testing have been offered by the University of Toronto since 1968. Occupational Health Protection Branch personnel of the Ministry of Health were involved in the curriculum design and the teaching process. Other educational institutions have followed the course design for similar programs.

For many years the Industrial Hygiene Division of the Ministry of Health (later known as the Occupational Health Protection Branch) offered short-term courses on hygiene and health to Ministry of Labour inspectors and other interested groups in the province. The safety associations, funded through the Workers' Compensation Board, and the Ontario Federation of Labour also offer educational programs, although these are usually related to safety rather than occupational health. These and other groups in the province promote occupational health seminars and conferences.

In conclusion, while it may be stated that occupational health care in Ontario has continued to grow over the years and is now an important part of the health care system, there is serious concern in Ontario about the poor credibility that company employed occupational health personnel have with union leaders. This must be rectified if workers are to be effectively served and if they are to have confidence in the professionals best able to help them. As our industrial society further develops, we will need to find solutions to workers' health problems that are, as yet, unknown; but occupational health practitioners will be better able through specialist education to identify work-related health problems and suggest solutions. Prevention, however,

will require the co-operative efforts of government, employers, unions and workers, and a lessening of adversarial attitudes.

Résumé

Cet article porte sur l'évolution de la médecine du travail en Ontario, les services offerts et les changements apportés à la législation.

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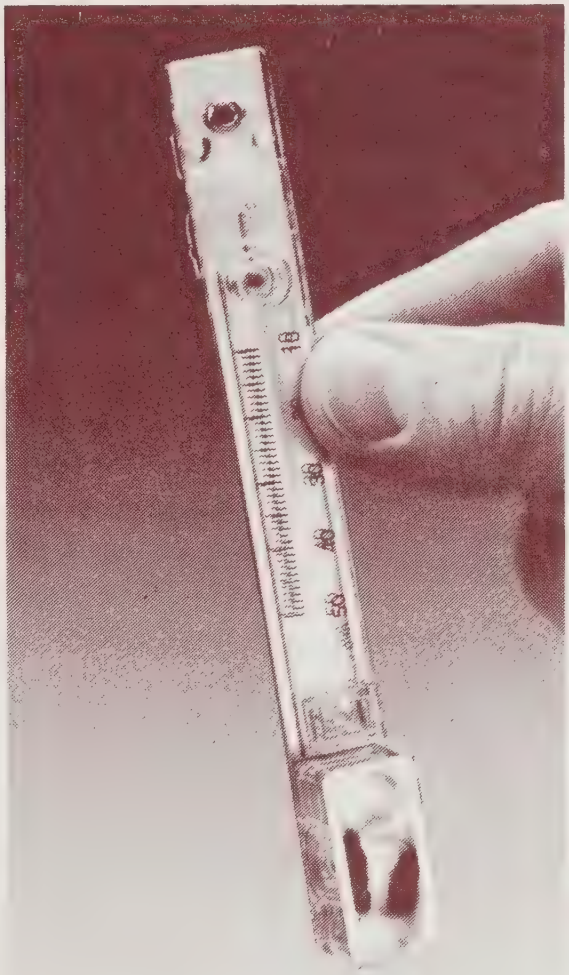

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R.J. (Rudy) Fliegl, Associates, 75 Graydon Hall Drive, Suite 2605, Don Mills, Ontario, M3A 3M5.	(416) 441-1916
Goodfellow Consultants Inc., 6515C Mississauga Road North, Mississauga, Ontario, L5N 1A6.	(416) 858-4424
Guelph Chemical Laboratories, 246 Silvercreek Parkway North, Guelph, Ontario N1H 1E7.	(519) 836-2313
Hatch Associates Ltd., 21 St. Clair Avenue East, Toronto, Ontario, M4T 1L9.	(416) 962-6350
Michael Holliday & Ass., 149 Bayswater Avenue, Ottawa, Ontario, K1Y 2G2.	(613) 728-9769

Ron Hussain Associates,
964 Oxford Street West,
London, Ontario,
N6H 1V4.
(519) 471-7860

Independent Measurement and
Technology Inc., (IMET)
1271 Denison Street,
Unit 58,
Markham, Ontario,
L3R 4B5.
(416) 477-4638

Industrial Hygiene Services,
Occupational Health and
(Laboratory)
Safety Lab.,
(Dept. Chemical Engineering)
University of Toronto,
200 College Street,
Toronto, Ontario,
M5S 1A4.
(416) 978-5617
(416) 978-5292

MacLaren Plansearch Inc.,
23 Yonge Street,
7th Floor,
Toronto, Ontario,
M5E 1E7.
(416) 365-7275

Monserco Ltd.,
6620 Kitimat Road,
Mississauga, Ontario,
L5N 2B8.
(416) 821-1033

Occupational Health Centre,
Queen's University,
Botterell Hall,
8th Floor,
Kingston, Ontario,
K7L 3N6.
(613) 547-5749

Occupational Health and
Safety Resources Centre,
University of Western Ontario,
Bioengineering Building,
London, Ontario,
N6A 5B9.
(519) 661-3044

Proctor and Redfern Group, 45 Greenbelt Drive, Don Mills, Ontario, M3C 3K3.	(416) 445-3600
R & R Laboratories Ltd., 1264 Algonquin Boulevard, Peterborough, Ontario, K9M 6N4.	(705) 748-9564 or 1506
R.G. Ryckman Ass. Ltd., 629A Queen Street East, Suite 202, Sault Ste. Marie, Ontario, P6A 2A6.	(705) 759-6231
Rowan Williams Davies & Irwin Inc., 650 Woodlawn Road, Guelph, Ontario, N1K 1B8.	(519) 823-1311
Sourcex Technologies, 845 Central Parkway West, Mississauga, Ontario, L5C 2V9.	(416) 272-0632

Noise Assessment and Control

A & R Computer Hearing Conservation Consultants, 5227 Yonge Street, Willowdale, Ontario, M2N 5P8.	(416) 225-1718
Acres International Limited, P.O. Box 1001, 5259 Dorchester Road, Niagara Falls, Ontario, L2E 6W1	(416) 374-5315
or	
1123 Northside Road, Burlington, Ontario L7M 1H4	(416) 335-6771 (ask for Niagara Falls extension 5315)
or	
480 University Avenue, Toronto, Ontario, M5G 1V2.	(416) 595-2000 (ask for Niagara Falls extension 5315)

Altech Environmental
Consulting Ltd.,
274 Johnson Avenue,
Willowdale, Ontario,
M2N 1H6.
(416) 226-0148

Aprel Inc.,
38 Antares Drive,
Nepean (Ottawa), Ontario,
K2E 7V2.
(613) 727-0334

The Audiology Clinic,
305 Boler Road,
London, Ontario,
N6K 2K1.
(519) 657-2094

Barman Swallow Associates,
1 Greensboro Drive,
Suite 401,
Rexdale, Ontario,
M9W 1C8.
(416) 245-7501

The Canadian Hearing Society,
271 Spadina Road,
Toronto, Ontario,
M5R 2V3.
(416) 964-9595

Canadian Industrial
Audiological Services,
222 McIntyre Street West,
North Bay, Ontario,
P1B 2Y8.
(705) 474-8441

Centre for Occupational
Health and Safety,
University of Waterloo,
Waterloo, Ontario,
N21 3G1.
(519) 885-1211

Clayton Environmental
Consultants Ltd.,
400 Huron Church Road,
Windsor, Ontario
N9C 2J9.
(519) 255-9797

The Company Nurse – Occupational Health and Safety Programs, 385 The West Mall, Suite 267, Etobicoke, Ontario, M9C 1E7.	(416) 622-7660
Concord Scientific Corp., 2 Tippett Road, Downsview, Ontario, M3H 2V2.	(416) 630-6331
Envirotest Inc., 2 Sheppard Avenue East, Suite 900, Willowdale, Ontario, M2N 5Y7.	(416) 222-8487
R.J. (Rudy) Fliegl, Associates, 75 Graydon Hall Drive, Suite 2605, Don Mills, Ontario, M3A 3M5.	(416) 441-1916
Guelph Chemical Laboratories, 246 Silvercreek Parkway North, Guelph, Ontario, N1H 1E7.	(519) 836-2313
Hatch Associates Ltd.,, 21 St. Clair Avenue East, Toronto, Ontario, M4T 1L9.	(416) 962-6350
Hearing Conservation Consultants, 2877 Ellesmere Road, Suite 532, Scarborough, Ontario, M1E 4C1.	(416) 282-7796
Hearing Measurements Co. Ltd., 40 Finchgate Boulevard, Bramalea, Ontario L6T 3J1.	(416) 791-1428

Michael Holliday & Ass., (613) 728-9769
149 Bayswater Avenue,
Ottawa, Ontario,
K1Y 2G2.

Hooker Noise Control Inc., (416) 856-6070
249 Trowers Road,
Woodbridge, Ontario,
L4L 1A8.

Humantech Inc., (705) 435-4601
10 Queen Street,
Cookstown, Ontario,
L0L 1L0.

Ron Hussain Associates, (519) 471-7860
964 Oxford Street West,
London, Ontario,
N6H 1V4.

IDE Processes Corp., (416) 877-1078
307 Armstrong Avenue,
Georgetown Ontario,
L7G 4X6.

Industrial Hygiene Services, (416) 978-5617
Occupational Health and (416) 978-5292
(Laboratory)
Safety Lab.,
(Dept. Chemical Engineering)
University of Toronto,
200 College Street,
Toronto, Ontario,
M5S 1A4.

LEQ Measurement Ltd., (416) 791-3440
175 Advance Blvd.,
#12,
Brampton, Ontario,
L6T 4J1.

MacLaren Plansearch Inc., (416) 365-7275
23 Yonge Street,
7th Floor,
Toronto, Ontario,
M5E 1E7.

McMaster University
Occupational Health Lab.,
1200 Main Street West,
Hamilton, Ontario,
L8N 3Z5.
(416) 525-9140

Mobile Medical Diagnostics,
MDS Health Group Ltd.,
364 Evans Avenue,
Toronto, Ontario,
M8Z 1K5.
(416) 252-5885

Monserco Ltd.,
6620 Kitimat Road,
Mississauga, Ontario,
L5N 2B8.
(416) 821-1033

Morton Industrial Hygiene
Services Ltd.,
185 Hiscock Boulevard,
Scarborough, Ontario,
M1G 1T9.
(416) 439-0074

Occupational Health Centre,
Queen's University,
Botterell Hall,
8th Floor,
Kingston, Ontario,
K7L 3N6.
(613) 547-5749

Occupational Health Services
509-199 Shaughnessy Boulevard,
Willowdale, Ontario,
M2J 1J9
(416) 494-0614

Occupational Health and
Safety Resources Centre,
University of Western Ontario,
Bioengineering Building,
London, Ontario,
N6A 5B9.
(519) 661-3044

Occupational/Environmental
Health Unit,
University of Toronto,
Toronto, Ontario,
M5S 1A8.
(416) 978-4519

Ontario Research Foundation, Sheridan Park Research Community, Mississauga, Ontario, L2K 1B3.	(416) 822-4111
Pollutech Ltd., 1090 Speers Road, Oakville, Ontario, L6L 2X4.	(416) 844-1900
Proctor and Redfern Group, 45 Greenbelt Drive, Don Mills, Ontario, M3C 3K3.	(416) 445-3600
R & R Laboratories Ltd., 1264 Algonquin Boulevard, Peterborough, Ontario, K9M 6N4.	(705) 748-9564 or 1506
R.G. Ryckman Ass. Ltd., 629A Queen Street East, Suite 202, Sault Ste. Marie, Ontario, P6A 2A6.	(705) 759-6231
Resource Centre for Occupational Health and Safety, Lakehead University, Oliver Road, Thunder Bay, Ontario, P7B 5E1.	(807) 345-4031
Rowan Williams Davies & Irwin Inc., 650 Woodlawn Road, Guelph, Ontario, N1K 1B8.	(519) 823-1311
Senes Consultants Ltd., 499 McNicoll Avenue, Willowdale, Ontario, M2H 2C9.	(416) 499-5030
TSL Professional Services Ltd., 1140 Fewster Drive, Unit 1, Mississauga, Ontario, L4W 1A1.	(416) 624-1145 or 625-1544

Audiometry

A & R Computer Hearing Conservation Consultants, 5227 Yonge Street, Willowdale, Ontario, M2N 5P8.	(416) 225-1718
The Audiology Clinic, 305 Boler Road, London, Ontario, N6K 2K1.	(519) 657-2094
The Canadian Hearing Society, 271 Spadina Road, Toronto, Ontario, M5R 2V3.	(416) 964-9595
Canadian Industrial Audiological Services, 222 McIntyre Street West, North Bay, Ontario, P1B 2Y8.	(705) 474-8441
The Company Nurse – Occupational Health and Safety Programs, 385 The West Mall, Suite 267, Etobicoke, Ontario, M9C 1E7.	(416) 622-7660
Thunder Bay Audiology Ltd., 135 North Syndicate Avenue, Suite 200, Thunder Bay, Ontario, P7C 3V3.	(807) 623-0322
Valcoustics Canada Ltd., 30 Drewry Avenue, Suite 502, Toronto, Ontario, M2M 4C4.	(416) 223-8191
Vibron Ltd., 1720 Meyerside Drive, Mississauga, Ontario, L5T 1A3.	(416) 677-4922

Dr. Alexander Franklin, 8 Appleton Avenue, Suite 100, Toronto, Ontario, M6E 3A3.	(416) 653-1221
Hearing Conservation Consultants, 2877 Ellesmere Road, Suite 532, Scarborough, Ontario M1E 4C1.	(416) 282-7796
Hearing Conservation Services, P.O. Box 304, Orillia, Ontario, L3V 6J6.	(705) 325-4084
Hearing Measurements Co. Ltd., 40 Finchgate Boulevard, Bramalea, Ontario, L6T 3J1.	(416) 791-1428
Industrial Audiometry Services Ltd., 92 Rutherford Road North, Brampton, Ontario, L6V 2J2.	(416) 435-0097
King and Associates, 7 Hagerman Boulevard, Unionville, Ontario, L3R 2A8 or 496 Davis Drive, Newmarket, Ontario, L3V 2P3.	(416) 477-2794 (416) 853-4993
Mobile Medical Diagnostics, MDS Health Group Ltd., 364 Evans Avenue, Toronto, Ontario, M8Z 1K5.	(416) 252-5885
Occupational Health and Safety Resources Centre, University of Western Ontario, Bioengineering Building, London, Ontario, N6A 5B9.	(519) 661-3044

Occupational/Environmental Health Unit,
University of Toronto,
Toronto, Ontario,
M5S 1A8. (416) 978-4519

Sontex/Impco Health Services,
222-1743 St. Laurent Boulevard,
Ottawa, Ontario,
K1G 3V4. (613) 521-8313

Thunder Bay Audiology Ltd.,
135 North Syndicate Avenue,
Suite 200,
Thunder Bay, Ontario,
P7C 3V3. (807) 623-0322

Wilson Medical Centre,
136 Wilson Street,
Hamilton, Ontario,
L8R 1E2. (416) 526-6250

Vibration Assessment and Control

Barman Swallow Associates,
1 Greensboro Drive,
Suite 401,
Rexdale, Ontario,
M9W 1C8. (416) 245-7501

Humantech Inc.,
10 Queen Street,
Cookstown, Ontario,
L0L 1L0. (705) 435-4601

LEQ Measurement Ltd.,
175 Advance Boulevard, #12,
Brampton, Ontario,
L6T 4J1. (416) 791-3440

Vibron Ltd.,
1720 Meyerside Drive,
Mississauga, Ontario,
L5T 1A3. (416) 677-4922

Asbestos Consulting

CSA Building Sciences,
21 Carson Street,
Toronto, Ontario,
M8W 3R7.
(416) 255-2371

Clayton Environmental
Consultants Ltd.,
400 Huron Church Road,
Windsor, Ontario,
N9C 2J9.
(519) 255-9797

Concord Scientific Corp.,
2 Tippett Road,
Downsview, Ontario,
M3H 2V2.
(416) 630-6331

Dominion Soil Investigation Inc.,
Consulting Sail and Foundation Engineers,
104 Crockford Road,
Scarborough, Ontario,
M1R 3C6.
(416) 751-6565

Gore & Storrie Ltd.,
Consulting Engineers and Architects,
1670 Bayview Avenue,
Toronto, Ontario,
M4G 3C2.
(416) 485-7715

Trevor Harris and Associates,
431 Richmond Street East,
Toronto, Ontario,
M2A 1R1.
(416) 864-9144

Ilenchuk & Associates Ltd.,
Consultants,
7 Lynedock Crescent,
Don Mills, Ontario,
M3A 2A7.
(416) 445-4441

MacLaren Plansearch Inc.,
23 Yonge Street,
7th Floor,
Toronto, Ontario,
M5E 1E7.
(416) 365-7275

Northwest Training and Development,
438 Franklin Street South,
Thunder Bay, Ontario,
P7E 1R7. (807) 622-6077

Occupational Health and Safety Resources Centre,
University of Western Ontario,
Bioengineering Building,
London, Ontario,
N6A 5B9. (519) 661-3044

PSI Mechanical Services Inc.,
880 Wellington Street,
Suite 608,
Ottawa, Ontario,
K1R 6K7. (613) 233-1414

D.J. Pinchin Technical Consulting Ltd.,
Suite 750,
2 Robert Speck Parkway,
Mississauga, Ontario,
L4Z 1H8. (416) 279-1629

Proctor and Redfern Group,
45 Greenbelt Drive,
Don Mills, Ontario,
M3C 3K3 (416) 445-3600
or
200 Syndicate Avenue,
5th Floor,
Thunder Bay, Ontario,
P7E 1C8. (807) 623-3449

R.G. Ryckman Ass. Ltd.,
629A Queen Street East,
Suite 202,
Sault Ste. Marie, Ontario,
P6A 2A6. (705) 759-6231

Training/Education Programs

The Canadian Hearing Society,
271 Spadina Road,
Toronto,Ontario,
M5R 2V3. (416) 964-9595

Centre for Occupational Health and Safety, University of Waterloo, Waterloo, Ontario, N2I 3G1.	(519) 885-1211
Concord Scientific Corp., 2 Tippett Road, Downsview, Ontario, M3H 2V2.	(416) 630-6331
Evans Medical Industrial Clinic, 364 Evans Avenue, Toronto, Ontario, M8Z 1K5.	(416) 252-5885
Goodfellow Consultants Inc., 6515C Mississauga Road North, Mississauga, Ontario, L5N 1A6.	(416) 858-4424
Ron Hussain Associates, 964 Oxford Street West, London, Ontario, N6H 1V4.	(519) 471-7860
Industrial Hygiene Services, Occupational Health and (Laboratory) Safety Lab., (Dept. Chemical Engineering) University of Toronto, 200 College Street, Toronto, Ontario, M5S 1A4.	(416) 978-5617 (416) 978-5292
Northeast Ontario Occupational Health and Safety Centre, 1400 Barry Downe Road, Sudbury, Ontario, P3A 3V8.	(705) 566-8101
Occupational Health Centre, Queen's University Botterell Hall, 8th Floor, Kingston, Ontario, K7L 3N6.	(613) 547-5749

Occupational Health Services,
509-199 Shaughnessy Boulevard,
Willowdale, Ontario,
M2J 1J9.
(416) 494-0614

Occupational Health and
Safety Resources Centre,
University of Western Ontario,
Bioengineering Building,
London, Ontario,
N6A 5B9.
(519) 661-3044

Occupational/Environmental
Health Unit,
University of Toronto,
Toronto, Ontario,
M5S 1A8.
(416) 978-4519

D.J. Pinchin Technical
Consulting Ltd.,
Suite 750,
2 Robert Speck Parkway,
Mississauga, Ontario,
L4Z 1H8.
(416) 279-1629

R & R Laboratories Ltd.,
1264 Algonquin Boulevard,
Peterborough, Ontario,
K9M 6N4.
(705) 748-9564
or 1506

Resource Centre for
Occupational Health and Safety,
Lakehead University,
Oliver Road,
Thunder Bay, Ontario,
P7B 5E1.
(807) 345-4031

Occupational Medicine and Nursing

The Company Nurse —
Occupational Health and
Safety Programs,
385 The West Mall,
Suite 267,
Etobicoke, Ontario,
M9C 1E7.
(416) 622-7660

Evans Medical Industrial Clinic, 364 Evans Avenue, Toronto, Ontario, M8Z 1K5.	(416) 252-5885
Dr. Alexander Franklin, 8 Appleton Avenue, Suite 100, Toronto, Ontario, M6E 3A3.	(416) 653-1221
Humantech Inc., 10 Queen Street, Cookstown, Ontario, L0L 1L0.	(705) 435-4601
King and Associates 7 Hagerman Boulevard, Unionville, Ontario, L3R 2A8	(416) 477-2794
or 496 Davis Drive, Newmarket, Ontario, L3V 2P3.	(416) 853-4993
Mobile Medical Diagnostics, MDS Health Group Ltd., 364 Evans Avenue, Toronto, Ontario, M8Z 1K5.	(416) 252-5885
Dr. Miles Moore, 4800 Leslie Street, Suite 409, Willowdale, Ontario, M2J 2K9.	(416) 493-1791
Occupational Health Centre, Queen's University, Botterell Hall, 8th Floor, Kingston, Ontario, K7L 3N6.	(613) 547-5749
Occupational/Environmental Health Unit, University of Toronto, Toronto, Ontario, M5S 1A8.	(416) 978-4519

Sontex/Impco Health Services,
222-1743 St. Laurent Boulevard,
Ottawa, Ontario,
K1G 3V4. (613) 521-8313

Wilson Medical Centre,
136 Wilson Street,
Hamilton, Ontario,
L8R 1E2. (416) 526-6250

Ergonomic Assessments

Human Factors North, Inc.,
118 Baldwin Street,
Toronto, Ontario,
M5T 1L6. (416) 596-1252

Humantech Inc.,
10 Queen Street,
Cookstown, Ontario,
L0L 1L0. (705) 435-4601

Systems Ergonomics Inc.,
P.O. Box 1042,
Station "B",
Downsview, Ontario,
M3H 5V5. (416) 881-5064

Other Services

Industrial Chemical Inventories, Emergency Planning

Acres International Limited,
P.O. Box 1001,
5259 Dorchester Road,
Niagara Falls, Ontario,
L2E 6W1 (416) 374-5315

or

1123 Northside Road,
Burlington, Ontario,
L7M 1H4 (416) 335-6771
(ask for Niagara Falls
extension 5315)

or

480 University Avenue,
Toronto, Ontario,
M5G 1V2. (416) 595-2000
(ask for Niagara Falls
extension 5315)

Occupational Health and Safety Audits and Program Planning

Altech Environmental Consulting Ltd.,
274 Johnson Avenue,
Willowdale, Ontario,
M2N 1H6.
(416) 226-0148

Industrial Psychology

Bellair Health Centre,
Dr. M. Harminc,
94 Cumberland Street,
Suite 907,
Toronto, Ontario,
M5R 1K9.
(416) 964-0072

Consultation to Management

The Company Nurse –
Occupational Health and
Safety Programs,
385 The West Mall,
Suite 267,
Etobicoke, Ontario,
M9C 1E7.
(416) 622-7660

Workers' Compensation, Claims Review, Weekly Indemnity Monitoring

The Company Nurse –
Workers' Compensation and
Rehabilitation Program,
385 The West Mall,
Suite 260,
Etobicoke, Ontario,
M9C 1E7.
(416) 622-7660

Rehabilitation Programs Consultation to Management

Evans Medical Industrial Clinic,
364 Evans Avenue,
Toronto, Ontario,
M8Z 1K5.
(416) 252-5885

Lighting, Heat Stress, Accident Investigations,

Humantech Inc., (705) 435-4601
10 Queen Street,
Cookstown, Ontario,
L0L 1L0.

Physiotherapy

King and Associates, (416) 477-2794
7 Hagerman Boulevard,
Unionville, Ontario,
L3R 2A8
or
496 Davis Drive, (416) 853-4993
Newmarket, Ontario,
L3V 2P3.

Consultation to Management

Hugh Nelson Associates, (416) 447-2687
47 Donaree Drive,
Don Mills, Ontario,
M3A 1M5

HEPA Filtered Vacuums

Nilfisk Ltd., (416) 669-6003
200 Connie Crescent,
Unit 7,
Concord, Ontario,
L4K 1M1.

Complete Occupational Hygiene Services for Management

Occugiene International Inc., (416) 823-2579
821 Sunningdale Bend,
Mississauga, Ontario,
L5J 1G1.

Wind Tunnel Testing

Rowan Williams Davies (519) 823-1311
& Irwin Inc.,
650 Woodlawn Road,
Guelph, Ontario,
N1K 1B8.

Local Extraction Systems

Sourcex Technologies,
845 Central Parkway West,
Mississauga, Ontario,
L5C 2V9.
(416) 272-0632

Materials Handling, Work Station Design

Systems Ergonomics Inc.,
P.O. Box 1042,
Station "B",
Downsview, Ontario,
M3H 5V5.
(416) 881-5064

Toxicology Consulting Services

Wellington Environmental
Consultants Inc.,
P.O. Box 1261,
2-291 Woodlawn Road,
Guelph, Ontario,
N1H 6N6.
(519) 822-2436

Résumé

Cette liste est destinée aux employeurs qui pourraient avoir besoin d'aide pour répondre aux exigences de la *Loi sur la santé et la sécurité au travail* et des règlements qui en découlent.

Book Review

Human Aspects of Occupational Vibration.
Donald E. Wasserman

Advances in Human Factors/Ergonomics Series, Volume 8.

Published by Elsevier Science Publishers. B.V. New York 1987.

Price $78 U.S.

This is a very readable volume, and the author has collated the relevant information well. In North America it is estimated that over 7,000,000 workers are exposed to whole body vibration and over 1,000,000 to hand-arm. The topic is therefore important.

The epidemiology of both hand-arm and whole body vibration is concisely reviewed, and it is nice to see included as an appendix a reproduction of the 1918 report by Alice Hamilton of her investigation of stone cutters, which is always a pleasure to read. The screening tests for hand-arm vibration are reviewed, and the author quite rightly expresses concern for more objectivity. There has been beneficial progress with tests and also a revision of the classification by stage since the chapter was sent to press, and the reader will need to note current knowledge from the journals.

The physiological effects of whole body are well presented, and the author clearly states that fatigue, vibration at whole body resonant frequency, and rest periods are the key factors. How they are divided through the workday all play a complex role in overall performance decrement. Other chapters deal clearly with mechanical vibration concepts and definitions, instrumentation and measurement.

The development of standards is fully described, particularly ISO 5349.2 and the ACGIH TLV for hand-arm vibration. The former uses as its marker point Stage I assuming a four-hour-per-day exposure and gives exposure times for percentiles. The curves should not be used for exposure greater than 50 m/s^2 or exposure times exceeding 25 years. The ACGIH TLV on the other hand is aimed to be protective from Stage 3 upwards, but some recent research reports suggest that it may be protective for Stage I as well. The ISO 2631 standard for whole body vibration is also discussed.

Each chapter contains a good reference list and bibliography, so the reader is well directed. As an addition to the literature this book needs to be read by all practising hygienists as well as all those health professionals interested in this topic.

I am glad to have it on my bookshelf and can wholeheartedly commend it.

P.L. Pelmear

Publications Available From the Government Book Store

Revised Regulations of Ontario, 1980 Regulation 692/80 Industrial Establishments

Revised Regulations of Ontario, 1980 Regulation 691/80 Construction Projects as amended by O.Reg 635/86

Inventory of Agents or Combinations of Agents for the Purpose of Section 21 of the Act Ontario Regulation 693/80

Revised Regulations of Ontario, 1980 Regulation 694/80 Mines and Mining Plants as amended by O.Regs 226/83, 569/83, 365/86, 450/86, 569/86, 654/86 and 258/87

Regulation respecting Lead – made under the Occupational Health and Safety Act Ontario Regulation 536/81 as amended by O.Reg. 23/87

Regulation respecting Mercury – made under the Occupational Health and Safety Act Ontario Regulation 141/82 as amended by O.Reg. 23/87

Regulation respecting Vinyl Chloride – made under the Occupational Health and Safety Act Ontario Regulation 516/82 as amended by O.Reg. 23/87

Regulation respecting Coke Oven Emissions – made under the Occupational Health and Safety Act Ontario Regulation 517/82 as amended by O.Reg. 23/87

Regulation respecting Asbestos – made under the Occupational Health and Safety Act Ontario Regulation 570/82 as amended by O.Regs. 655/85 and 23/87

Critical Injury Defined Ontario Regulation 714/82

Regulation respecting Fire Fighters Protective Equipment – made under the Occupational Health and Safety Act Ontario Regulation 125/83

Regulation respecting Isocyanates – made under the Occupational Health and Safety Act Ontario Regulation 455/83 as amended by O.Reg. 23/87

Regulation Respecting Silica – made under the Occupational Health and Safety Act Ontario Regulation 769/83 as amended by O.Reg. 23/87

X-Ray Safety Code made under the Healing Arts Radiation Protection Act (R.S.O., 1980, Chapter 195 as amended S.O., 1984, Chapter 9) Ontario Regulation 45/84

Regulation to Amend Regulation 691 of Revised Regulations of Ontario, 1980 Ontario Regulation 156/84

Regulation to Amend Regulation 694 of Revised Regulations of Ontario, 1980 Ontario Regulation 190/84

Regulation respecting Teachers – made under the Occupational Health and Safety Act Ontario Regulation 191/84

Regulation respecting University Academics and Teaching Assistants – made under the Occupational Health and Safety Act Ontario Regulation 307/84

Regulation respecting Benzene – made under the Occupational Health and Safety Act Ontario Regulation 732/84 as amended by O.Reg. 23/87

Regulation respecting Acrylonitrile – made under the Occupational Health and Safety Act Ontario Regulation 733/84 as amended by O.Reg. 23/87

Regulation respecting Asbestos on Construction Projects and in Buildings and Repair Operations – made under the Occupational Health and Safety Act Ontario Regulation 654/85

Regulation respecting Arsenic – made under the Occupational Health and Safety Act Ontario Regulation 176/86 as amended by O.Reg. 23/87

Regulation for X-Ray Safety – made under the Occupational Health and Safety Act Ontario Regulation 632/86

Regulation respecting Oil and Gas – Offshore – made under the Occupational Health and Safety Act Ontario Regulation 633/86

Regulation respecting Diving – made under the Occupational Health and Safety Act Ontario Regulation 634/86

Regulation respecting Control of Exposure to Biological or Chemical Agents – made under the Occupational Health and Safety Act Ontario Regulation 654/86 as amended by O.Regs. 707/86 and 339/87

Regulation respecting Ethylene Oxide – made under the Occupational Health and Safety Act Ontario Regulation 146/87

Support Literature

An Occupational Health Nurse's Guide to the Preparation of a Policy and Procedure Manual

A Guide to the Occupational Health and Safety Act

A Guide for Joint Health and Safety Committees and Representatives in the Workplace

Designated Substances in the Workplace: A General Guide to the Regulations

Designated Substances in the Workplace: A Guide to the Lead Regulation

Designated Substances in the Workplace: A Guide to the Benzene Regulation

Designated Substances in the Workplace: A Guide to the Silica Regulation

Designated Substances in the Workplace: A Guide to the Mercury Regulation

Designated Substances in the Workplace: A Guide to the Asbestos Regulation for Construction Projects, Buildings and Repair Operations

News and Notes

Backs For The Future: A National Conference on Back Problems and Their Prevention.
March 16-18, 1988.
Westin Hotel, Calgary, Alberta.

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Coming Events

February 29—March 4, 1988	International Injury Prevention Congress, MELBOURNE, AUSTRALIA. For further information, contact: Secretariat, IIPC, PO Box 29, Parkville, Victoria, Australia, 3052. Phone (613) 387-9955.
March 8—10, 1988	First International Conference on the Global Impact of AIDS, LONDON, ENGLAND. For further information, contact: Emap Maclaren Exhibitions Ltd., PO Box 138, Token House, 79-81 High Street, Croydon, England, CR9 3SS.
April 5—8, 1988	International Non-Ionising Radiation Workshop, MELBOURNE, AUSTRALIA. For further information, contact: Dr. C. Roy, Australian Radiation Laboratory, Lower Plenty Road, Yallambie, Victoria, Australia, 3085.
April 10—17, 1988	Seventh International Congress of the International Radiation Protection Association, SYDNEY, AUSTRALIA. For further information, contact: IRPA Secretariat, GPO Box 2609, Sydney NSW, Australia, 2001.
April 11—13, 1988	IAQ 88: Engineering Solutions to Indoor Air Problems, ATLANTA, GA. For further information, contact: Jim Norman, Manager of Technical Services, ASHRAE, 1791 Tullie Circle, N.E. Atlanta, GA, U.S.A., 30329.
April 12—15, 1988	Annual British Occupational Hygiene Society Conference, NOTTINGHAM, ENGLAND. For further information, contact: BOHS, 1 St. Andrew's Place, Regent's Park, London, NW1 4LB.
April 19—20, 1988	Particle Size Analysis 1988, GUILDFORD, U.K. For further information, contact: PSA '88, Dept. of Chemical & Process Engineering, University of Surrey, Guildford, Surrey, England, GU2 5XH. Phone 0483 509170.

April 27—29, 1988	4th Symposium on Handling of Environmental and Biological Samples in Chromatography, BASLE, SWITZERLAND. For further information, contact: Professor R.W. Frei, Department of Analytical Chemistry, Free University, De Boelelaan 1083, 1081 HV Amsterdam, The Netherlands. Phone (020) 5485379.
May 10—12, 1988	HAZTECH Canada Conference and Exhibition - 1988 Dangerous Goods and Hazardous Waste Conference, MISSISSAUGA, CANADA. For further information, contact: Chuck Bierley, Exhibition Management Co. Inc., 6143 S. Willow Drive, Suite 100, Englewood, CO, U.S.A., 80111; Phone (303) 850-9119.
May 15—20, 1988	1988 American Industrial Hygiene Conference, 'Joint Activities in Industrial Hygiene', SAN FRANCISCO, CALIFORNIA, U.S.A. For further information, contact: Patricia George, AIHC, 475 Wolf Ledges Parkway, Akron, OH, U.S.A., 44311-1087.
June 6—8, 1988	International Social Security Association's International Section for the Chemical Industry - Current Issues in Biotechnology Genetic Engineering and in Substances Hazardous to Health, FRANKFURT, FRG. For further information, contact: Sekretariat der Internationalen Sektion der IVSS, Postfach 10 14 80, D-6900 Heidelberg 1, FRG, 0 62 21 52 30.
June 6—9, 1988	First Congress of the International Society of Ocular Toxicology, TORONTO, CANADA. For further information, contact: Sandra Leith, Continuing Medical Education, University of Toronto, Toronto, Ont., Canada M5S 1A8. Phone (416) 978-2718.
June 14—16, 1988	3rd IFAC/IFIP/IEA/IFORS Conference on Man-Machine Systems Analysis, Design and Evaluation, OULU, FINLAND. For further information, contact: 3rd MMS, The Finnish Society of Automatic, PO Box 165, Helsinki, Finland, SF-00101.

July 11—15, 1988	Society of Occupational Medicine, Annual Provincial Meeting: New Technology – New Challenges. GUILDFORD, ENGLAND. For further information, contact: Dr. I.M. Dawson, Society of Occupational Medicine, London Group, 6 St. Andrew's Place, Regent's Park, London, England, NW1 4LB.
August 1—5, 1988	International Ergonomics Association 10th Congress, SYDNEY, AUSTRALIA. For further information, contact: Secretariat IEA88, PO Box 380, Spit Junction, NSW, Australia, 2088.
August 12—16, 1988	First Symposium on Biological Effects, Hazards and Protection from NonIonizing Radiation in Outdoor Applications. STOCKHOLM, SWEDEN. For further information, contact: NIRO 87, c/o KREAB Congrex, Box 5619, Stockholm, Sweden, S-114 86.
August 15—18, 1988	ICCEF 88. Third International Conference on the Combined Effects of Environmental Factors, FINLAND. For further information, contact: Chairman, Doc DR Olavi Manninen, ICCEF 88, Secretariat, c/o Dept. of Public Health, Medical Faculty, University of Tampere, PO Box 607, Tampere, Finland, SF-33101.
August 21—25, 1988	Noise '88 – The 5th International Congress on Noise as a Public Health Problem – STOCKHOLM, SWEDEN. For further information, contact: Noise '88 c/o Reso Congress Service, Stockholm, Sweden, S-113 92.
August 23—26, 1988	VIIth International Pneumoconioses Conference, PITTSBURGH, U.S.A. For further information, contact: Robert E. Glenn, Conference Chairman, National Institute for Occupational Safety and Health, 944 Chestnut Ridge Road, Morgantown, West Virginia, U.S.A., 26505-2888.
August 30—September 1, 1988	Inter-Noise 88. 17th International Conference on Noise Control Engineering, AVIGNON, FRANCE. For further information, contact: Inter-Noise 88, Secretariat, BP 23, Senlis Cedex, France, F 60302.

September 5—8, 1988	CIB Conference – Health Buildings '88. STOCKHOLM, SWEDEN. For further information, contact: The Swedish Council for Research, S:t Goransgatan 66, Stockholm, Sweden, S-112 33.
September 5—9, 1988	Fourth International Conference on Nickel Metabolism and Toxicology. ESPOO, FINLAND. For further information, contact: Fourth International Conference on Nickel Metabolism and Toxicology, c/o Institute of Occupational Health/ Ms Seija Toro, Topeliuksenkatu 41 a A, Helsinki, Finland, SF-00250. Phone: (+358 0) 474 71, Telex: 121394 tltx sf occuphealth, Telefax: 414634.
September 20—23, 1988	Second International Symposium on Ventilation for Contaminant Control, Ventilation 88, LONDON, ENGLAND. For further information, contact: British Occupational Hygiene Society, 1 St. Andrew's Place, Regent's Park, London, England, NW1 4LB.
October 5—8, 1988	ICOH Scientific Committee – Second International Workshop on Personal Computer and Data Banks in Occupational Health, PALMA DE MALLORCA, SPAIN. For further information, contact: Dr. Jose Sevillaa, Mutua Balear, c/. Obispo Campins 4, Palma de Mallorca, Balear Islands, Spain.
October 24—28, 1988	International Conference on Ergonomics, Occupational Safety and Health and the Environment, BEIJING, CHINA. For further information, contact: Conference Administrator, ICE-O-SHE, Darling Downs Institute of Advanced Education, PO Box 44, Darling Heights, Toowoomba, Qld, Australia, 4350.

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